iCS 80 INDUSTRIAL SYSTEM SITE PLANNING AND INSTALLATION GUIDE

Manual Order Number: 9800798A

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PRINTED IN USA A124/1079/5K DD

PREFACE

This manual provides information necessary to plan, assemble, install and operate an iCS 80 System. Additional information is available in the following documents:

- *Intel iCS 80 Industrial Chassis Service Manual*, Order No. 9800799.
- *Intel iSBC 635 Power Supply Hardware Reference Manual*, Order No. 9800298.
- *Intel iSBC 640 Power Supply Hardware Reference Manual*, Order No. 9800803.
- *Intel iCS 910 Analog Signal Conditioning/Termination Panel Hardware Reference Manual*, Order No. 9800800.
- *Intel iCS 920 Digital Signal Conditioning/Termination Panel Hardware Reference Manual*, Order No. 9800801.
- *Intel iCS 930 AC Signal Conditioning/Termination Panel Hardware Reference Manual*, Order No. 9800802.
- *Intel iSBC 86/12 Single Board Computer Hardware Reference Manual*, Order No. 9800645.
- *Intel iSBC 80/30 Single Board Computer Hardware Reference Manual*, Order No. 9800311.
- *Intel iSBC 80/20 Single Board Computer Hardware Reference Manual*, Order No. 9800484.
- *Intel iSBC 80/10 Single Board Computer Hardware Reference Manual*, Order No. 9800230.
- *Intel iSBC 604/614 Cardcage Hardware Reference Manual*, Order No. 9800708.
- *Intel iSBC 80/05 Single Board Computer Hardware Reference Manual*, Order No. 9800483.

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CHAPTER 1
GENERAL INFORMATION

1-1. INTRODUCTION

The Industrial Control Series 80 (iCS 80), which is a member of Intel's expanding line of industrial applications computer systems, provides the microprocessor-based control system required in many industrial applications. Since the iCS 80 is of a modular design, it is easily expanded as the application requirements grow. This chapter will describe the iCS 80 as a system and will outline the system expansion limits.

1-2. SYSTEM DESCRIPTION

Figure 1-1 shows an iCS 80 System, including a power supply, an iCS 80 Industrial Chassis, a single board computer, an analog interface board, one filler panel, and two termination panels. The System is designed to allow other Intel products to be used as options, thereby giving a broader range of applications. Since the iSBC 604 Cardcage Assembly is used, the iCS 80 System is compatible with the Intel MULTIBUS standards outlined in the *MULTIBUS Interfacing Application Note*, AP-28. The iSBC microprocessor boards and the analog interface boards mount into the iSBC 604 Cardcage Assembly, which in turn, mounts readily into the iCS 80 Chassis.

The iCS 80 Chassis allows convenient front access for all servicing and maintenance. The four fans and the ventilation slots designed into the top and bottom of the Chassis provide improved heat removal. The control panel, included as part of the Chassis, contains the OFF/ON/LOCK switch, three indicators, two pushbutton switches, and the chassis power fuse. The chassis includes three filler panels to cover the unused chassis area.

1-3. EQUIPMENT SUPPLIED

The equipment supplied with the iCS 80 Chassis includes an installation package, and documentation. Both of these, however, contains several parts.

The installation package contains all screws and cables required to add the optional equipment to the iCS 80 Chassis, and the mounting hardware required to install the system. The installation package includes each of the following items:

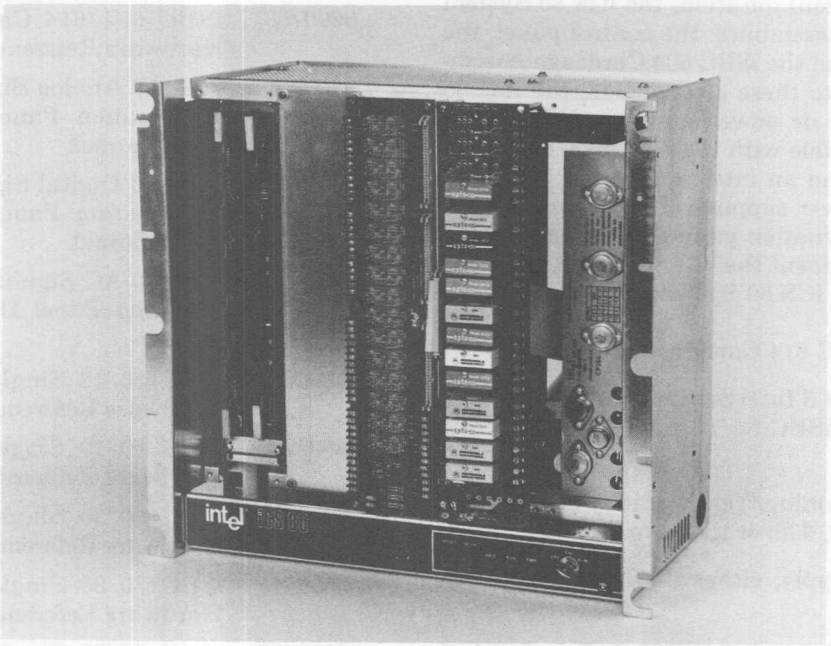


Figure 1-1. iCS 80 System

Part No.	Description	Qty.
4003080	NEMA compatible mounting kit	1 ea.
3003032	Power supply cables	2 sets
3003036	Flat cable clamps	2 ea.
	Panel mount connectors	4 ea.
	ac power cord	1 ea.
	Mounting screws	32 ea.

The documentation which accompanies the iCS 80 Chassis includes the *iCS 80 Industrial System Site Planning and Installation Guide* — Order No. 9800798, the *iSBC 604/614 Cardcage Hardware Reference Manual* — Order No. 9800708, and the *iCS 80 Industrial Chassis Hardware Reference Manual* — Order No. 9800799. These manuals include the necessary drawings and schematics to support the iCS 80 System in its basic configuration. A chassis wiring diagram, a control panel printed circuit board logic diagram, and a replacement parts listing are located in the Service Information section of the *iCS 80 Industrial Chassis Hardware Reference Manual.* Similar information for the cardcage is contained in the iSBC 604/614 Cardcage documentation.

1-4. AVAILABLE OPTION EQUIPMENT

The advantage of using Intel's iCS 80 System is that the System will readily accept, with some exceptions, the entire Intel single board computer product line.

In its most basic configuration, the iCS 80 System consists of three assemblies: the control panel, the iCS 80 Chassis, and the iSBC 604 Cardcage Assembly. In addition to these components, the iCS 80 System requires a dc power supply, a CPU board that is pin-compatible with the iSBC 604/614 Cardcage Assembly, and an interface board. Intel provides optional power supplies, CPU boards, signal conditioning/termination panels, and analog interface boards to augment the iCS 80. Some available accessories for the iCS 80 System are:

- Up to two iSBC 614 Cardcage Assemblies.
- A maximum of 3 Intel Single Board Computers; including the iSBC 86/12, 80/10, 80/20, 80/30, or 80/05.
- Signal Conditioning/Termination Panels; either model 910, 920, 930, or a mixture.
- One power supply; either the iSBC 635 or the iSBC 640.
- Any of the iSBC 711, 724, 732, 517, or 519 I/O Interface Boards, as required by the application.
- Any of the iSBC 104, 108, and 116 I/O expansion and memory boards, as required.

Some applications may require special mounting or enclosure facilities. Chapter 2 outlines these facilities and shows some suggested configurations.

1-5. OPTION DOCUMENTATION LIST

The documentation, like the iCS 80 System, is of a modular design. That is, the various options for the iCS 80 (power supplies, A/D converters, I/O boards, single board computers, terminator boards, and cardcages) are documented in independent and complete manuals. Manual Order Numbers are listed for each of these optional documentation packages, as well as for the basic iCS 80 System documentation.

With the exception of the *iCS 80 Industrial System Site Planning and Installation Guide*, each of the manuals listed contains the pertinent drawings and reference material required for that product. The *iCS 80 Industrial System Site Planning and Installation Guide* supplies the information required to tie these various products together as an iCS 80 System.

Manual Order No.	Description
9800798	iCS 80 Industrial System Site Planning and Installation Guide.
9800799	iCS 80 Industrial Chassis Hardware Reference Manual.
9800708	iSBC 604/614 Cardcage Assembly Hardware Reference Manual.
9800800	iCS 910 Analog Signal Conditioning/ Termination Panel Hardware Reference Manual.
9800801	iCS 920 Digital Signal Conditioning/ Termination Panel Hardware Reference Manual.
9800802	iCS 930 AC Signal Conditioning/Termination Panel Hardware Reference Manual.
9800645	iSBC 86/12 Single Board Computer Hardware Reference Manual.
9800230	iSBC 80/10 Single Board Computer Hardware Reference Manual.
9800484	iSBC 80/20 Single Board Computer Hardware Reference Manual.
9800611	iSBC 80/30 Single Board Computer Hardware Reference Manual.
9800483	iSBC 80/05 Single Board Computer Hardware Reference Manual.

9800485 iSBC 711 Analog Input Board Hardware Reference Manual.

9800486 iSBC 724 Analog Output Board Hardware Reference Manual.

9800487 iSBC 732 Analog Combination Input/Output Board Hardware Reference Manual.

9800388 iSBC 517 Combination I/O Expansion Board Hardware Reference Manual.

9800385 iSBC 519 Programmable I/O Expansion Board Hardware Reference Manual.

9800298 iSBC 635 Power Supply Hardware Reference Manual.

9800803 iSBC 640 Power Supply Hardware Reference Manual.

1-6. SPECIFICATIONS

The specifications for the iCS 80 System are listed in table 1-1. Since the limits of the various components of the iCS 80 System are different, the specifications listed in table 1-1 will fall within the requirements of all components in the System.

Table 1-1. iCS 80 System Specifications

PHYSICAL CHARACTERISTICS		
Height (chassis)		43.5 cm (17.4 in)
Width (chassis)		48.5 cm (19.0 in) at front panel 43.5 cm (17.4 in) behind front panel
Depth (chassis)		30.0 cm (12.0 in) with all protrusions
Weight	(no power supply)	16.8 Kg (37.0 lb)
	(635 Power Supply)	23.6 Kg (52.0 lb)
	(640 Power Supply)	30.0 Kg (67.0 lb)
ELECTRICAL CHARACTERISTICS (With 635 Power Supply)		
Input Frequency		47 - 63 Hz
Input Voltage		100, 115, 215, or 230 Vac ±10%
Line Regulation		±0.1% for 10% line change
Load Regulation		±0.1% for 10% load change
Output Ripple and Noise		10 mV peak-to-peak maximum (dc to 500kHz)
Transient Response		Less than 50μ sec for 50% load change
ELECTRICAL CHARACTERISTICS (With 640 Power Supply)		
Input Frequency		47 - 63 Hz
Input Voltage		100, 115, 215, or 230 Vac ±10%
Line Regulation		±0.1% for 10% line change
Load Regulation		±0.1% for 50% load change
Output Ripple and Noise		10 mV peak-to-peak maximum (dc to 500 kHz)
Transient Response		Less than 50μ sec for 50% load change
ENVIRONMENTAL CHARACTERISTICS		
Operating Temperature		0° to 50°C (32° to 122°F)
Non-operating Temperature		-40° to 85°C (-40° to 185°F)
Humidity		Up to 90%, non-condensing

CHAPTER 2
SITE PLANNING

2-1. INTRODUCTION

This chapter explains how to prepare a site for the installation of an iCS 80 System. The site planning presented herein will be relatively brief; consisting of sections on preparation, safety, air conditioning, wiring, and mounting requirements. Each of these is detailed in the following text.

2-2. PREPARING FOR INSTALLATION

In preparation to installing your system, you should familiarize yourself with the information in all sections of this Guide. It will aid in identifying and planning the important considerations associated with a system installation, including:

- Selecting a site for the system.
- Planning the location of the equipment.
- Planning safety precautions for the equipment and personnel.
- Planning adequate air conditioning facilities.
- Providing wiring facilities.
- Selecting compatible mounting facilities.

2-3. SELECTING A SITE

In selecting a site, ensure that there is adequate provision for:

- Proper routing of electrical power and control cables.
- A planned working location for comfort and efficiency.
- Space for portable support and test equipment which may be used.
- Clean air plenums, if necessary for hazardous locations.
- Reduction of electromagnetic interference from outside sources, both conducted and radiated.
- Temperature and humidity considerations.
- Vibration considerations.
- Minimizing static electricity.
- Space for future equipment needs.

2-4. PLANNING THE LOCATION

Select a location in which the pedestrian and motorized traffic is of relatively low volume. Clearances should be planned in accordance with article 110 of the National Electrical Code (NFPA 70) or the equivalent local or regional codes. Consider placing the equipment so that indicators are easily seen.

2-5. PLANNING SAFETY PRECAUTIONS

Some of the safety precautions that you should consider are:

- Keep the work area and system equipment as clean as possible.
- Provide adequate ventilation in areas using chemicals that produce harmful or corrosive vapors, unless the System is contained with a NEMA enclosure.
- Clearly label the circuit breakers supplying power to the equipment.
- If the System is not mounted into a NEMA enclosure, verify that environmental conditions potentially dangerous to people or equipment do not exist at the site. Such conditions include excessive dust, vibration, high humidity, and strong magnetic or electrical fields.
- When feasible and applicable, plan to install the equipment in an area that is not carpeted. Static discharges associated with carpets can cause system failures.
- Where applicable, consult with your insurance carrier for suggestions and recommendations when considering the various aspects of fire safety.
- Inspect all wiring and electrical outlets for proper grounding, voltage, polarity, and phasing.
- Consider installation of lightning arresters on your field wiring network, particularly where routed through the air via telephone lines.

Local and regional ordinances usually exist which will apply to your installation site for equipment such as the iCS 80 System. In the U.S., most municipalities have adopted the requirements of NFPA (National Fire Prevention Association) 70, the National Electrical Code. Other countries normally have a similar national code. These codes distinguish between two basic environments: Ordinary Locations and Hazardous Locations. These locations are discussed in the following text.

2-6. ORDINARY LOCATIONS

The iCS 80 System has been designed to comply with the Underwriters Laboratories Safety Standard for Process Control Equipment, UL 1092. When installed as described in this manual, the iCS 80 provides adequate protection against shock, fire, and casualty hazards; and should comply with most local and regional requirements for installations in ordinary locations.

2-7. HAZARDOUS LOCATIONS

Hazardous locations can roughly be defined as locations in which the hazardous concentrations of flammable gases or vapors, combustible dust, or easily ignitable fibers or flyings may exist during normal operation, or may be handled, processed, stored, or used. Various classes and divisions of hazardous locations have been defined and are described in Article 500 of the National Electrical Code (NFPA 70). To determine what hazardous classes and division your site would fall under, refer to Hazardous Locations Classification (NFPA 70C).

In order to install the iCS 80 System in a hazardous location, adequate positive-pressure ventilation must be provided using a source of clean air. The requirements for positive-pressure ventilation systems are described in NFPA 496, *Standard for Purged and Pressurized Enclosures for Electrical Equipment.* The severity of the requirements depends upon the hazardous class and division of your installation site. The cost of your installation can be minimized by selecting the least hazardous installation site. This manual does not include any description of installations in hazardous locations.

2-8. PLANNING AIR CONDITIONING

The iCS 80 System is designed for use in a factory environment. Therefore, dedicated air conditioning is not required for the System so long as the temperature and humidity limits specified in table 2-1 are not exceeded and the iCS 80 is not installed in a hazardous location. If the equipment is in a hazardous location, a source of clean air will be necessary. The requirements for such clean air sources are described in NFPA (National Fire Prevention Association) 496.

Each iCS 80 Chassis is equipped with four fans which supply adequate cooling to maintain ambient temperatures within the limits listed in table 2-1. Exercise care during installation to prevent obstruction of the chassis air flow openings.

Since the iCS 80 System is a modular product, the heat dissipation will change with the various configurations. In calculating total heat dissipation, use the component values listed in table 2-2. Figure the total heat dissipated by performing the multiplication and addition required.

In using heat-dissipation figures, you may wish to work with Kilo-calories or watts rather than BTU/hr. The conversion formula for BTU/hr to kilo-calories/hr is:

kilo-calories/hr = (BTU/hr)/(3.968)

The formula for converting BTU/hr to watts is:

watts = (BTU/hr)/(3.414)

If you find that air conditioning is required, remember that local and regional codes and regulations may exist covering the use of air conditioning devices in general, and as applied to computer equipment in particular. You are responsible for ensuring that your air conditioning complies with these codes and regulations. Reference Article 440 of the National Electrical Code.

Table 2-1. iCS 80 System Temperature and Humidity Limits

Component	In-Use Temperature Range	Storage Temperature Range
Temperature (Ambient)	32° to 122°F (0° to 50°C)	-40° to 185°F (-40° to 85°C)
Humidity	10% to 90% (no condensation)	10% to 90% (no condensation)

2-9. PLANNING WIRING FACILITIES

Most site installations will include power, ground, and field wiring. Whether modifying existing facilities or developing entirely new facilities, a qualified electrician is required. Where field wiring is routed through telephone cables, a qualified telephone technician is also required.

The National Electrical Code, and local codes and regulations, may cover the installation of power, ground, and field wiring. You are responsible for ensuring that your site complies with these codes. Additional requirements apply if your site is located in hazardous areas. See Article 500 of the National Electrical Code.

Table 2-2. iCS 80 System Heat Dissipation

Component	Quantity		BTU/hr		Total
(A) iSBC 86/12 Processor	_____	times	109.8	equals	_____
(A) iSBC 80/05 Processor	_____	times	47.4	equals	_____
(A) iSBC 80/30 Processor	_____	times	97.2	equals	_____
(A) iSBC 80/20 Processor	_____	times	92.2	equals	_____
(A) iSBC 80/10 Processor	_____	times	84.0	equals	_____
(B) iCS 910 Terminator	_____	times	11.0	equals	_____
(B) iCS 920 Terminator	_____	times	41.0	equals	_____
(B) iCS 930 Terminator	_____	times	275.0	equals	_____
(C) iSBC 635 Power Supply	_____	times	450.0	equals	_____
(C) iSBC 640 Power Supply	_____	times	950.0	equals	_____
iCS 80 Chassis	1	times	5.0	equals	_____
iSBC 711 Analog Input Interface	_____	times	29.4	equals	_____
iSBC 724 Analog Output Interface	_____	times	34.8	equals	_____
iSBC 732 Analog I/O Interface	_____	times	43.2	equals	_____
Other	_____	times	_____	equals	_____
		Total Heat Dissipated (BTU/hr)			_____

NOTES:

(A) A maximum quantity of 3 per iCS 80 System, except for the 80/10 with maximum quantity of 1.

(B) Any mixture of these. Heat dissipation figures are maximum.

(C) Only one power supply; either the iSBC 635 or the iSBC 640. Figures are maximum and may be derated linearly for less than full loads.

2-10. POWER WIRING

Since the iCS 80 is a modular product, the power requirements will vary with the different configurations. In figuring the total power requirements, use the component values listed in table 2-3. Figure the total power required by performing the multiplication and addition.

At 60-Hz installations, the iCS 80 System operates on a 115 volt, single-phase, two wire plus ground source. At 50-Hz installations, the iCS 80 System operates on a 230 volt, single-phase, two wire plus ground power source.

All sites must maintain a steady line voltage within ±10 percent of the normal rated voltage, as measured during system operation, and the power source must be provided with overcurrent protection not exceeding 20 amperes.

For maximum reliability, the system should be connected to a dedicated power source via an isolation transformer. This eliminates noise transients induced into the power line.

The iSBC 635 and the iSBC 640 Power Supplies used in the iCS 80 System are capable of operating at several input power levels; i.e., 100, 115, 215, or 230 Vac. Refer to the appropriate power supply manual for transformer wiring modification instructions if you plan to use other than 115 or 230 Vac.

The iCS 80 System is designed and constructed to interface with the wiring systems described in the National Electrical Code.

2-11. GROUND WIRING

Proper system grounding is vitally important to the safe and successful operation of the system. Install a

grounding wire from the ground terminal in the outlet to the building main power ground or some equivalent. A water pipe may be used if the resistance to ground is less than 6 ohms.

The grounding wire should be as short as possible and of the same or larger gauge than the phase conducting wires. The conduit containing the power cable must not be used for grounding.

Table 2-3. iCS 80 System Power Requirements

Component	Quantity		Ampere Requirement Amps		Total
(A) iSBC 86/12 Processor	_____	times	_____	equals	_____
(A) iSBC 80/05 Processor	_____	times	_____	equals	_____
(A) iSBC 80/10 Processor	_____	times	_____	equals	_____
(A) iSBC 80/20 Processor	_____	times	_____	equals	_____
(A) iSBC 80/30 Processor	_____	times	_____	equals	_____
(B) iCS 910 Terminator	_____	times	0.2	equals	_____
(B) iCS 920 Terminator	_____	times	1.5	equals	_____
(B) iCS 930 Terminator	_____	times	0.5	equals	_____
iCS 80 Chassis	_____	times	3.0	equals	_____
iSBC 711 Analog Input Interface	_____	times	1.7	equals	_____
iSBC 724 Analog Output Interface	_____	times	2.0	equals	_____
iSBC 732 Analog I/O Interface	_____	times	2.5	equals	_____
Other	_____	times	_____	equals	_____
			Total Power Required		_____ Amps

NOTES:

(A) A maximum quantity of 3 per iCS 80 System, except for the iSBC 80/10 with a limit of 1. Find the ampere requirement figures for the configuration of your processor in the respective hardware reference manual.

(B) Any mixture of these. Ampere requirement figures are maximum.

2-12. FIELD WIRING

Field wiring consists of data lines installed and maintained by the user for the express purpose of carrying applications signals to and from the iCS 80 System. The requirements of the field wiring vary according to the characteristics of the data signals and the environment. Ensure that field wiring, whether installed in an ordinary or hazardous location, con forms to the requirements of the National Electrical Code.

Low voltage analog signal applications (less than 10V) are generally more susceptible to noise. A 20 or 22 gauge shielding type of cable is recommended for use in this type of application. If a shielded cable is used, ensure that only one end of the shielding is grounded; grounding both ends will cause a loop which may adversely affect system operation.

When installing low voltage field wiring, ensure that it is not in close proximity and parallel to any high voltage power lines. Magnetic fields resulting from the high voltage power lines will induce signals into the field wiring and may cause the data to be unusable. Low level field wiring should not run farther than 2000 feet from the iCS 80 System. Over distances greater than 2000 feet, the excessive resistance and capacitance of the field wiring may distort and attenuate the data signals.

High voltage and ac signal applications are less susceptible to noise and, therefore, less restrictive. The length of the high level and ac field wiring is limited by cable resistance, and the wiring is not affected as greatly by magnetic fields.

2-13. PLANNING MOUNTING FACILITIES

The iCS 80 System is designed to be compatible with the standard 19″ RETMA rack for use in ordinary locations. The majority of the System components and options will mount inside the iCS 80 Chassis. However, the iCS 910, 920, and 930 Signal Conditioning/Termination Panels are designed to mount outside the iCS 80 Chassis. Up to three iCS 910, 920, and/or 930 Signal Conditioning/Termination Panels may be mounted vertically across the front of the chassis. Terminator panels may also be mounted horizontally across the 19″ RETMA rack above or below the chassis.

The entire iCS 80 System, including a chassis, power supply, and signal conditioning/termination panels, mounts inside a NEMA free standing or wall mounted enclosure. Some applications in ordinary locations may require this type of enclosure. Ensure that your mounting facilities conform to local and National Electrical Code requirements for the specific application.

2-14. PLANNING SYSTEM CONFIGURATIONS

Some typical iCS System configurations are shown in figure 2-1, 2-2, and 2-3. Details of each configuration are listed in the following text.

NOTE

The configurations presented in the following text are intended to show some of the various configurations for the iCS 80 System. Evaluate your system limitations (such as accessibility, space availability, and maintainability) and choose a configuration that satisfies your requirements.

Figure 2-1 shows an iCS 80 System mounted into a NEMA enclosure. All components of the System are mounted inside the enclosure and cooled by convection. Effectively, the NEMA enclosure acts as a heat sink. All connections to and from the enclosure should maintain the contamination seal between inside and outside.

The iCS 80 Chassis mounts into the enclosure and holds the one iSBC 604/614 Cardcage Assembly. Any configuration that includes the iCS 80 Chassis will be easier to install since the chassis contains some necessary power wiring and termination strips that must otherwise be improvised.

NOTE

The number of signal conditioning/termination panels is limited only by the requirements of the system and the capacity of the power supply.

Figure 2-2 shows a small iCS 80 System as mounted in a 19″ RETMA compatible rack. This configuration allows two methods of mounting terminator panels. Up to four iCS 910, 920, or 930 Signal Conditioning/Termination Panels may be mounted vertically across the front of the chassis or any number of terminator panels may be mounted on the RETMA rack, the only limitation being the capacity of the power supply.

Figure 2-3 shows a larger RETMA rack-mounted system. This configuration allows for installation of two signal conditioning/termination panels vertically across the front of the chassis and covering the power supply. More signal conditioning/termination panels may be mounted onto the RETMA rack above or below the iCS 80 Chassis. It is possible to exceed the capacity of the iSBC 640 Power Supply by installing 12 printed circuit boards into the three iSBC 604/614 Cardcage Assemblies. Therefore, you must examine your system closely to ensure that the power requirements fall within the capacity of the power supply.

NOTE

When termination panels are mounted onto the RETMA rack, separate the digital panels (iCS 920) from the analog panels (iCS 910) as much as possible to minimize signal interference.

Several strain-relief openings are designed into the iCS 80 Chassis to allow the user to route cables in a manner that minimizes the effects of digital and electrostatic noise on the iCS 80 System. To some extent, the filler panels included with the iCS 80 Chassis are useful as a noise shield for the system.

A configuration that includes more than one iCS 80 Chassis should include a common ground connector between the chassis frames to provide a common noise reference.

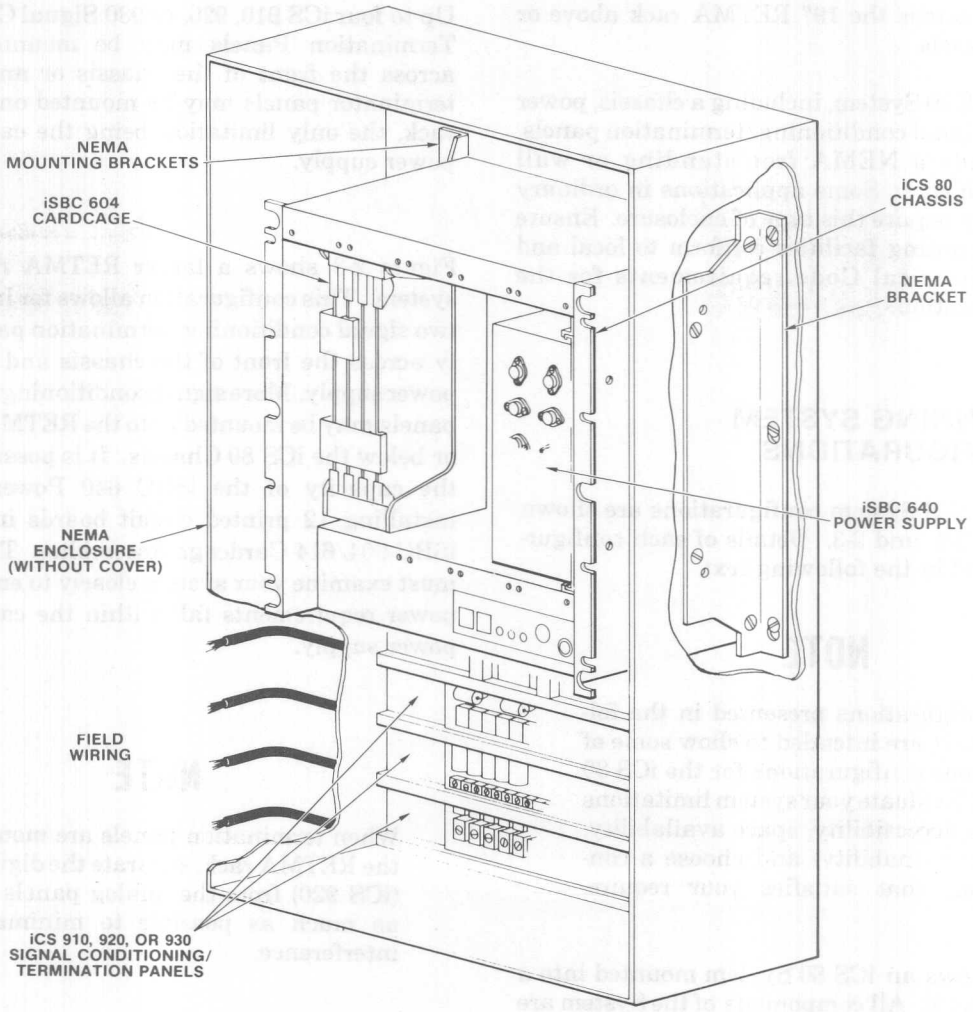


Figure 2-1. NEMA Mounted System

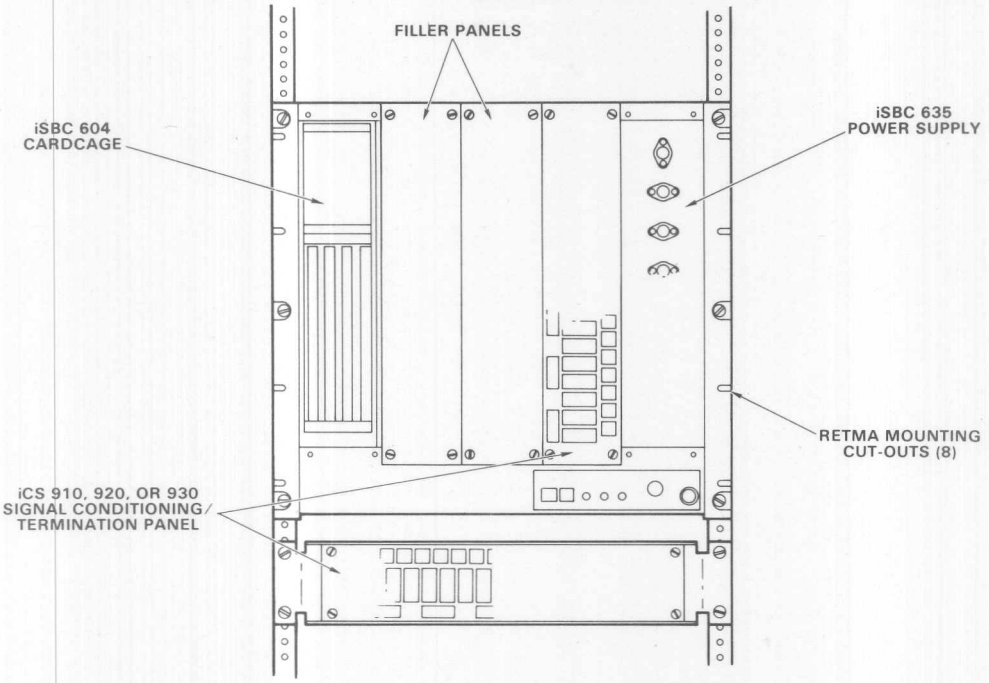


Figure 2-2. RETMA Mounted System

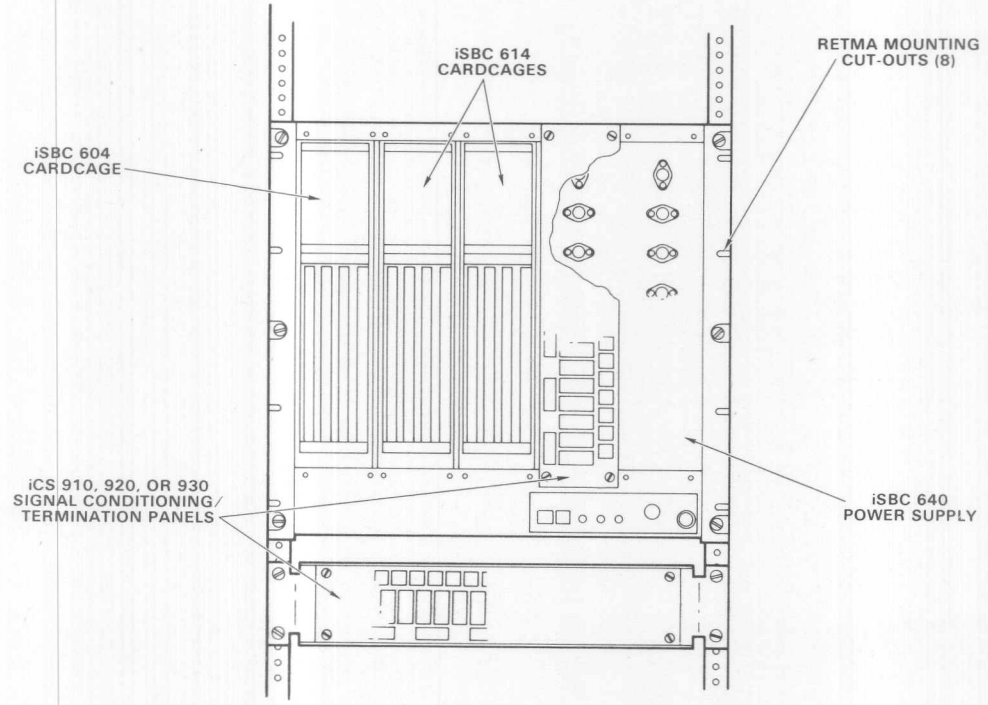


Figure 2-3. RETMA Mounted System

CHAPTER 3
PREPARATION FOR USE

3-1. INTRODUCTION

This chapter provides the information and references required to prepare the iCS 80 System for use. This section covers unpacking and inspection, installation considerations, interfacing considerations, user selectable options, and MULTIBUS priority organization.

3-2. UNPACKING AND INSPECTION

Inspect the shipping carton immediately upon receipt for evidence of mishandling during transit. If the shipping carton is severely damaged or waterstained, request that the carrier's agent be present when the carton is opened. If the carrier's agent is not present when the carton is opened and the contents of the carton are damaged, keep the carton and packing material for the agent's inspection.

For repairs to a product damaged in shipment, contact the Intel Technical Support Center to obtain a Direct Return Authorization number and further instructions. A purchase order should be submitted to the carrier with your claim.

It is suggested that salvagable shipping cartons and packing material be saved for future use in the event the product must be reshipped.

3-3. INSTALLATION CONSIDERATIONS

The following paragraphs provide important criteria for installing and interfacing the iCS 80 System.

3-4. CHASSIS MOUNTING

All hardware required to mount the iCS 80 Chassis into a 19″ RETMA (Radio-Electronics-Television Manufacturers Association) compatible rack or a NEMA (National Electrical Manufacturers Association) compatible enclosure is supplied in the installation package. Four 6-32 screws, including washers and nuts, are used to mount the iCS 80 Chassis onto any 19″ RETMA rack.

Four 6-32 screws and four 10-24 screws, including washers and nuts, are used to mount the iCS 80 Chassis onto the two NEMA brackets included in the installation kit. The NEMA brackets, in turn, mount into the NEMA enclosure.

3-5. USER-FURNISHED COMPONENTS

The user-furnished components list will vary according to the application and the types of options you select for use with your iCS 80 System. The various option boards may require such things as connectors, line drivers, line terminators, and ROM/EPROM elements. However, the documentation for each of these option boards contains a section which outlines the details of the user-furnished components. Other than the component requirements of the options, no user-furnished components are required for the normal use of the iCS 80 System.

3-6. POWER

The System power supplies, as shipped from the factory, are wired for 115 or 230 Vac, ±10%, 47 - 63 Hz operation. Instructions for converting the power supplies to 100 or 215 Vac operation are given in the respective manuals; i.e., the *iSBC 635 Power Supply Hardware Reference Manual*, Order No. 9800298, and the *iSBC 640 Power Supply Hardware Reference Manual*, Order No. 9800803.

3-7. COOLING

An iCS 80 System with one iSBC 604 Cardcage Assembly, an iSBC 635 Power Supply, and an iSBC 80/30 microprocessor dissipates a maximum of 1.1 Kg-Calories (225 BTU) of heat and adequate circulation of air must be provided to prevent an ambient temperature rise above 50°C (122°F).

3-8. PHYSICAL DIMENSIONS

The physical dimensions of the System, if totally contained within the iCS 80 Chassis, are as follows:

Width:	(at front panel)	48.5 cm (19.0 in)
	(behind front panel)	43.5 cm (17.4 in)
Height:		43.5 cm (17.4 in)
Depth:		30.0 cm (12.0 in)

3-9. INSTALLATION PROCEDURE

Since the iCS 80 System is modular, the installation procedures will vary with the mounting facilities and options selected for each System. Outlined in the following text is an installation sequence and an

installation procedure for the power supplies, the cardcages, printed circuit boards, and the signal conditioning/termination panels.

3-10. INSTALLATION SEQUENCE

The installation sequence outlined in the following text is suggested rather than required. The details required to perform each step are listed in subsequent paragraphs.

- Install the iSBC 604/614 Cardcage(s) into the iCS 80 Chassis.
- Install the iSBC 635 or 640 Power Supply into the iCS 80 Chassis.
- Insert the printed circuit boards (single board computers, I/O interface boards, etc.) into the cardcages.
- Mount the iCS 910, 920, and 930 Signal Conditioning/Termination Panels onto the System.

3-11. CARDCAGE INSTALLATION. The iSBC 604/614 Cardcage Assembly may be mounted with or without the use of an iCS 80 Chassis. If you choose to mount the cardcage separate from the chassis, reference the mounting instructions contained in the *iSBC 604/614 Cardcage Hardware Reference Manual* (9800708).

The iCS 80 Chassis comes equipped with one iSBC 604 Cardcage. To add more iSBC 614 Cardcages to the iCS 80 Chassis, use the following procedures:

WARNING

Hazardous voltages are present in the iCS 80 Chassis when power is applied. Disconnect the ac power cord before proceeding any further.

1) Remove the perforated top cover from the chassis. Label and save the three 6-32 X 3/8 screws /flat washers/lock washers and the two 6-32 self-tapping screws/flat washers for later use. Disconnect the fan power cord from the fan.
2) Remove and label the four 6-32 flat head screws securing the metal support/protection panel to the cardcage.
3) Remove and label the three 6-32 X 3/8 screws/ flat washers/lockwashers securing the support/ protection panel to the iCS 80 Chassis.
4) Slide the support/protection panel away from the cardcage, so that the addition cardcage(s) may be installed.
5) From the top, insert the additional iSBC 614 Cardcage Assembly into the chassis and align it with the first cardcage. Seat the 86-pin plug (on the iSBC 604 Cardcage Assembly) into the 86-pin socket (on the iSBC 614 Cardcage Assembly). Figure 3-1 shows the connectors on the back of the cardcages.
6) Using two 6-32 X 1/2 screws/fasteners from the installation kit with the iCS 80 Chassis, fasten the iSBC 604 and 614 Cardcage Assemblies together at the rear securing points. Reference figure 3-2.
7) Using two 6-32 X 3/4 screws/fasteners, fasten the cardcages together at the front securing points.
8) Secure the iSBC 614 Cardcage to the chassis with four 6-32 self-tapping screws/flat washers from the installation kit. The chassis securing points are shown in figure 3-2.
9) If another iSBC 614 Cardcage is to be installed, repeat steps 5 through 8.
10) After addition of the last iSBC 614 Cardcage Assembly, secure the support/protection panel to the chassis with three 6-32 X 3/8 screws/ flat washers/lock washers removed in step 3.
11) Using the two 6-32 X 3/8 flathead screws removed in step 2, secure the support/protection panel to the cardcage at the rear-most securing points.
12) Using the two 6-32 X 1/2 flathead screws removed in step 2, secure the support/protection panel to the cardcage at the front-most securing points.
13) Tighten the screws securing the support/protection panel.
14) Remove and label the two 4-40 screws/fasteners securing the 60-pin connector to the cardcage.
15) Remove the 60-pin connector from card slot J2A of the original cardcage and loosely mount it into the comparable location (card slot J2A) on the right-most cardcage.

NOTE

Ensure that the connector is mounted properly. The connector should be mounted so that the 3 wires (soldered to pins 28, 30, and 32 of the connector are closest to the J3A cardslot in the cardcage.

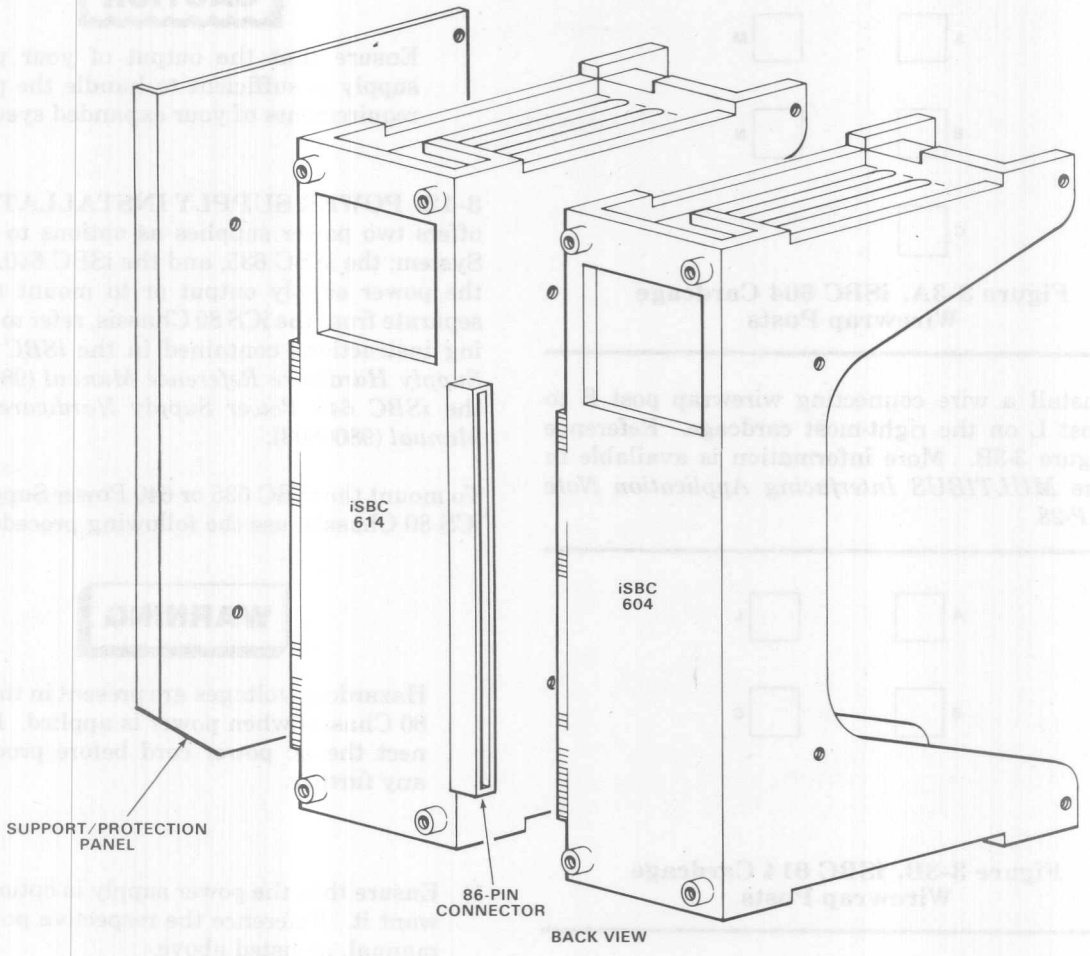


Figure 3-1. iSBC 604/614 Cardcage Connection

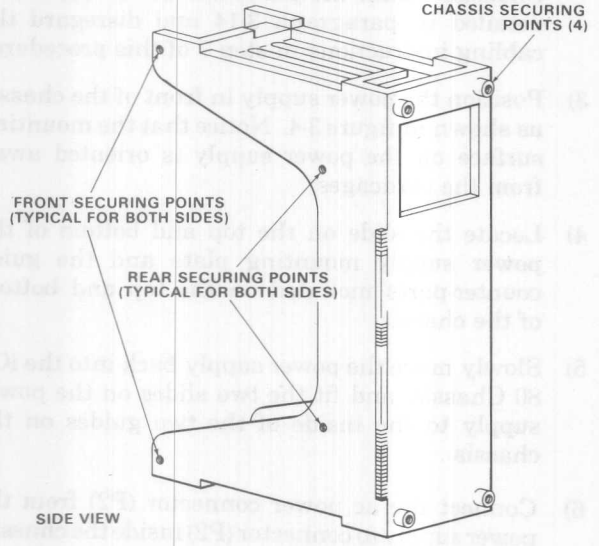


Figure 3-2. iSBC 604/614 Cardcage Securing Points

CAUTION

Mount the connector loosely. If the screws securing the connector are too tight, the printed circuit boards may seat improperly into the connector or may be damaged.

16) Insert the processor board into the J2 card slot of the right-most cardcage. Seat the edge connector on the board into the 60-pin and 86-pin connectors mounted in the rear of the J2 card slot.

17) Tighten the screws holding the 60-pin connector to the J2A card slot in the cardcage.

18) Remove the wire connecting wirewrap post B to post N on the original cardcage. Reference figure 3-3A.

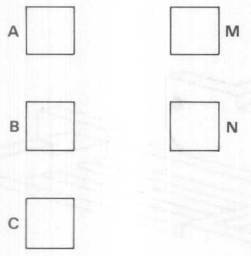


Figure 3-3A. iSBC 604 Cardcage Wirewrap Posts

19) Install a wire connecting wirewrap post B to post L on the right-most cardcage. Reference figure 3-3B. More information is available in the *MULTIBUS Interfacing Application Note AP-28.*

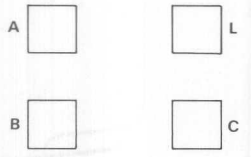


Figure 3-3B. iSBC 614 Cardcage Wirewrap Posts

20) Connect the dc power cables from the power supply directly to the cardcage connectors in this order:

iSBC 635 Power Supply

Power cable P6 to cardcage connector J6.
Power cable P8 to cardcage connector J8.

iSBC 640 Power Supply

Power cable P6U to cardcage connector J6.
Power cable P8U to cardcage connector J8.
Power cable P6L to cardcage connector J6.
Power cable P8L to cardcage connector J8.

22) Route the power supply cables through the cable clamps located in the inside lower rear of the chassis.

23) Using the three 6-32 X 3/8 screws/lock washers/ flat washers and the two self-tapping screws/ flat washers removed in step 1, replace the perforated top cover onto the chassis and re-connect the fan power cord onto the fan.

CAUTION

Ensure that the output of your power supply is sufficient to handle the power requirements of your expanded system.

3-12. POWER SUPPLY INSTALLATION. Intel offers two power supplies as options to the iCS 80 System; the iSBC 635, and the iSBC 640. To adjust the power supply output or to mount these units separate from the iCS 80 Chassis, refer to the mounting instructions contained in the *iSBC 635 Power Supply Hardware Reference Manual* (9800298) and the *iSBC 640 Power Supply Hardware Reference Manual* (9800803).

To mount the iSBC 635 or 640 Power Supply into the iCS 80 Chassis, use the following procedures:

WARNING

Hazardous voltages are present in the iCS 80 Chassis when power is applied. Disconnect the ac power cord before proceeding any further.

1) Ensure that the power supply is optioned as you want it. Reference the respective power supply manual, as listed above.

2) If you require the ability to remove or replace the power supply with only front access to the iCS 80 Chassis, install the panel mount connectors as detailed in paragraph 3-14 and disregard the cabling instructions in step 7 of this procedure.

3) Position the power supply in front of the chassis as shown in figure 3-4. Notice that the mounting surface on the power supply is oriented away from the cardcages.

4) Locate the slide on the top and bottom of the power supply mounting plate and the guide counter-parts mounted on the top and bottom of the chassis.

5) Slowly move the power supply back into the iCS 80 Chassis, and fit the two slides on the power supply to the inside of the two guides on the chassis.

6) Connect the ac power connector (P2) from the power supply to connector (P2) inside the chassis.

7) Route the power supply cables out through the rear of the chassis and connect them in this order:

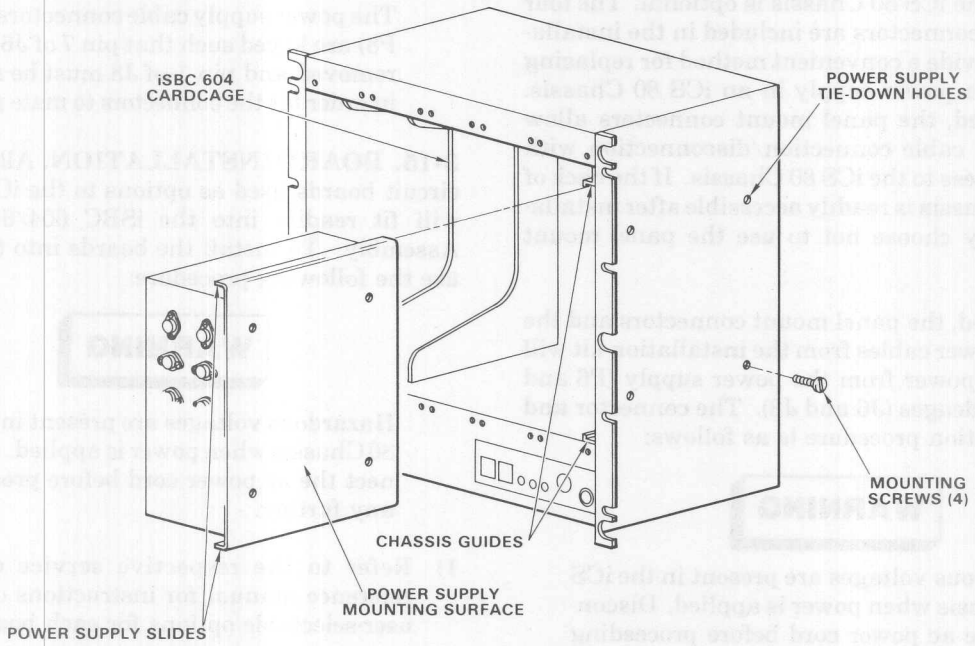


Figure 3-4. Power Supply Mounting

Power cable P6 to cardcage connector J6.

Power cable P8 to cardcage connector J8.

8) To complete the installation, secure the power supply. Insert four 10-24 screws, included in the installation package, through the holes in the right end of the chassis and screw them into the power supply. If quick removal of the power supply is desired, the four screws may be omitted.

NOTE

The iSBC 635 Power Supply includes one set of power cables which may be connected directly to the cardcage. The iSBC 640 Power Supply uses two sets of power cables; one set for the cardcage situated on the left end and one set for the cardcage on the right end of the iCS 80 Chassis. Two sets of power supply extension cables are provided in the installation package and used if the panel mount connectors are required.

3-13. POWER SUPPLY REMOVAL. The iSBC 635 and 640 Power Supplies are removed from the iCS 80 Chassis as follows:

WARNING

Hazardous voltages are present in the iCS 80 Chassis when power is applied. Disconnect the ac power cord before proceeding any further.

1) Ensure that power is removed from the iCS 80 System.

2) Unplug the power cables (P6 and P8) from the connectors (J6 and J8) on the back of the cardcage or from the panel mount connectors (J6 and J8) inside the chassis, depending on the configuration of the System.

3) Remove the four screws that hold the power supply to the right end of the iCS 80 Chassis.

4) Unplug the J2/P2 ac power cable connector.

5) Slowly slide the power supply out through the front of the iCS 80 Chassis.

3-14. PANEL MOUNT CONNECTOR INSTALLATION. Installation of the panel mount connectors into the iCS 80 Chassis is optional. The four panel mount connectors are included in the installation kit to provide a convenient method for replacing or removing a power supply in an iCS 80 Chassis. When installed, the panel mount connectors allow power supply cable connection/disconnection with only front access to the iCS 80 Chassis. If the back of the iCS 80 Chassis is readily accessible after installation, you may choose not to use the panel mount connectors.

When installed, the panel mount connectors and the two sets of power cables from the installation kit will interface the power from the power supply (P6 and P8) to the cardcages (J6 and J8). The connector and cable installation procedure is as follows:

WARNING

Hazardous voltages are present in the iCS 80 Chassis when power is applied. Disconnect the ac power cord before proceeding any further.

1) Locate the four panel mount connectors and the two extension cable sets included in the installation kit.

2) On each panel mount connector, cut off both sides of one of the outside pins, as the dashed lines show in figure 3-5.

3) Locate the four rectangular mounting holes beneath the power supply mounting area, and label them P6U, P8U, P6L, and P8L.

4) Push each connector into a mounting hole until the flanges on the connector seat securely. Mount the J6 panel mount connectors so that the removed pin is at the bottom, and mount the J8 connectors so that the removed pin is at the top.

NOTE

The panel mount connectors may be inserted from either direction, however, the suggested method is to insert them from the rear of the chassis.

5) Ensure that the panel mount connectors are seated securely, and install the cables between the panel mount connectors and the cardcages as shown in figure 3-5.

6) Connect the power supply output cables, one set with an iSBC 635 and two sets with an iSBC 640 Power Supply, to the panel mount connectors as shown in figure 3-5.

NOTE

The power supply cable connectors (P6 and P8) are keyed such that pin 7 of J6 must be removed and pin 1 of J8 must be removed in order for the connectors to mate properly.

3-15. BOARD INSTALLATION. All Intel printed circuit boards used as options to the iCS 80 System will fit readily into the iSBC 604/614 Cardcage Assembly. To install the boards into the cardcage, use the following procedure:

WARNING

Hazardous voltages are present in the iCS 80 Chassis when power is applied. Disconnect the ac power cord before proceeding any further.

1) Refer to the respective service or hardware reference manual for instructions on wiring the user-selectable options for each board.

CAUTION

Ensure that power is removed from the system whenever inserting or removing PC boards.

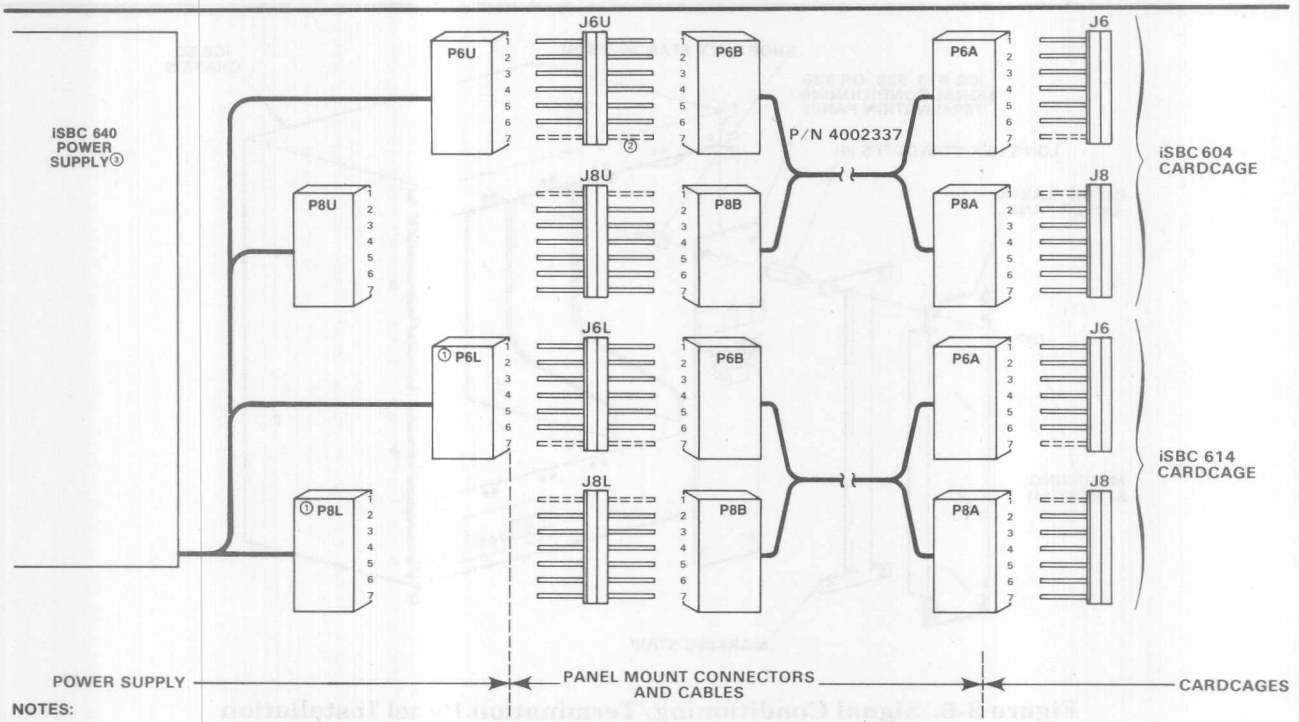
2) Install the single board computer (iSBC 80/05, 80/10, 80/20, 80/30, or 86/12) into the right-most J2 card slot in the iSBC 604/614 Cardcage, provided that you have not rewired that card slot for a dedicated function. Ensure that the 86-pin jack (J1) on the board slips securely into the cardcage plug (P1). On a multiple processor system, install the highest priority single board computer into the right-most J2 card slot and any others sequentially into the card slots immediately to the left. This procedure simplifies the MULTIBUS priority wiring.

3) Install any other Intel printed circuit boards that are to be used as options, i.e., iSBC 711, 724, 732, 517, 519 Interface Boards.

NOTE

Any user-supplied boards designed for use in the iCS 80 Chassis should also be installed at this time.

3-16. SIGNAL CONDITIONING/TERMINATION PANEL INSTALLATION. The iCS 910, 920, and 930 Signal Conditioning/Termination Panels are designed to mount onto the iCS 80 Chassis, to mount onto a 19″ RETMA rack, or to mount independently, as required by the application.



NOTES:
①This set of power supply cables is not available with the iSBC 635 Power Supply.
②Dashed line shows the removed pin on each panel mount connector.
③iSBC 635 Power Supply connectors are labeled P6 and P8.

Figure 3-5. Power Connections at the Panel Mount Connectors

To mount the units independently or on a 19″ RETMA rack, reference the mounting instructions in the respective Signal Conditioning/Termination Panel Hardware Reference Manual. Each signal conditioning/termination panel includes an installation kit containing screws, hex standoffs, cables, a RETMA mounting bracket, and a clear plastic cover to protect the board. To mount the iCS 910, 920, and 930 Signal Conditioning/Termination Panels onto the iCS 80 Chassis, use the following procedure:

WARNING

Hazardous voltages are present in the iCS 80 Chassis when power is applied. Disconnect the ac power cord before proceeding any further.

1) Locate the four shorter hex male/female standoffs included in the installation kit provided with the signal conditioning/termination panel.

2) Secure the four standoffs to the front of the iCS 80 Chassis; two on the top and two on the bottom. Reference figure 3-6.

3) Mount the iCS 910, 920, and 930 Signal Conditioning/Termination Panels onto the hex standoffs. Using four screws supplied with each panel, secure the panels to the hex standoffs.

NOTE

If filler panels are mounted on the chassis, you must remove them before installing the signal conditioning/termination panels. Included in the installation kit is an optional marking strip, plastic cover, and long standoffs that may be installed as shown in figure 3-6.

4) Connect the field wiring network to the panels. Table 3-1 lists the cabling methods available for interfacing the various signal conditioning/termination panels. Flat 50-pin connector cables are supplied with the termination panels.

3-16. INTERFACE REQUIREMENTS

The iCS 80, when equipped with a single board computer, is a complete computer system. The external connections to the System vary according to the type of single board computer used (iSBC 80/05, 80/10, 80/20, 80/30, 86/12). Refer to the hardware reference manual covering your single board computer if you require interfacing details.

3-17. MULTIBUS INTERFACE

MULTIBUS is the name given to the signal naming

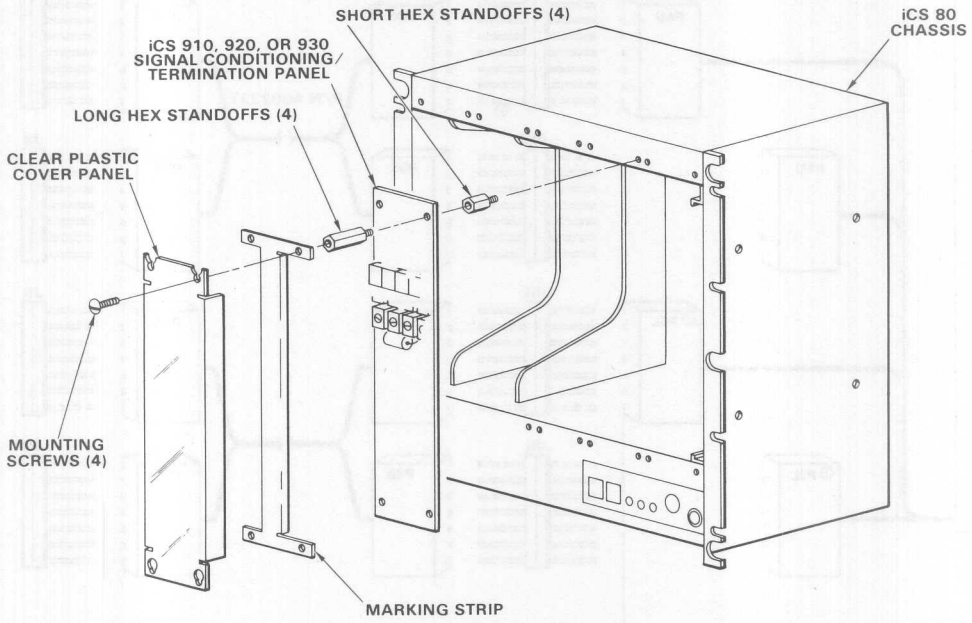


Figure 3-6. Signal Conditioning/Termination Panel Installation

and routing standard used by Intel on the backplane included as part of the iSBC 604/614 Cardcage. The MULTIBUS bus structure connects to the iCS 80 System processor through an 86-pin double-sided edge connector (P1). Once exposed to the backplane, all P1 MULTIBUS signals are available to each card slot of every iSBC 604/614 Cardcage Assembly. Table 3-2 is a pin assignment list for connector P1 and table 3-3 is a MULTIBUS Connector (P1) signal description.

The Auxiliary Connector (P2) is a 60-pin double-sided edge connector. Table 3-4 lists the P2 pin assignment and table 3-5 contains P2 signal descriptions.

3-18. MULTIBUS PRIORITY

In a multiprocessor system there may be more than one master requesting use of the MULTIBUS bus structure at a given instant. To solve this bus priority contention, connect the various masters in either a serial or a parallel priority mode. The procedure is listed in chapter 2 of the *iSBC 604/614 Cardcage Hardware Reference Manual,* Order Number 9800708.

3-19. JUMPER/SWITCH CONFIGURATION

User configured jumpers and switches exist for the single board computers, the signal conditioning/termination panels, the power supplies, and the cardcages. Reference the respective service and/or reference manuals for details on wiring and switch settings required for each of these options.

The iCS 80 Chassis contains only one user configured option, that allows the unit to be used with either 115 Vac or 230 Vac power. The hardware used for the line voltage selection is mounted onto the inside of the drop-down panel on the back of the chassis.

WARNING

Hazardous voltages are present in the iCS 80 Chassis when power is applied. Ensure that the ac power cord is disconnected before configuring TB1.

Normal "as-shipped" configuration of TB1 for 115 Vac operation includes jumpers connecting pins 1 to 2, 6 to 7, and 10 to 11. The unit may be modified for 230 Vac operation by inserting a jumper connecting pin 8 to 9, and removing the jumper connecting pins 6 to 7, and 10 to 11 on TB1.

CAUTION

If the iCS 80 Chassis is configured for 230 Vac operation, ensure that the power supply is also wired for 230 Vac operation before applying power. Failure to match the power supply to the source could result in damage to the equipment.

Table 3-1. Cabling Methods for iCS Signal Conditioning/Termination Panels

Device/Connector		iCS 910 Connectors	iCS 920 Connectors	iCS 930 Connectors
iSBC 711	J1	not used		
	J2	J2		
	J3	J3		
iSBC 724	J1	J1		
	J2	not used		
	J3	not used		
iSBC 732	J1	J1		
	J2	J2		
	J3	J3		
iSBC 80/10A	J1		J1[1]	J2[1] or J1/J3[1]
	J2		J1[2]	J2[2] or J1/J3[2]
iSBC 80/20	J1		J1	J2 or J1/J3
	J2		J1	J2 or J1/J3
iSBC 80/30	J1		J1	J2 or J1/J3
	J2		J1[3]	J2[3] or J1/J3[3]
iSBC 86/12	J1		J1	J2 or J1/J3
iSBC 80/05	J1		J1	J2 or J1/J3

Note 1: CPU port output signals are not in sequence at the terminator board.

Note 2: Requires special attention as outlined in Appendix A of the iCS 920 and 930 Hardware Reference Manuals.

Note 3: Requires 8041/8741 programming.

Table 3-2. MULTIBUS Connector (P1) Pin Assignments

Pin*	Signal	Function	Pin*	Signal	Function
1	GND	Ground	44	ADRF/	
2	GND		45	ADRC/	
3	+5V		46	ADRD/	
4	+5V		47	ADRA/	
5	+5V		48	ADRB/	
6	+5V		49	ADR8/	
7	+12V	Power input	50	ADR9/	
8	+12V		51	ADR6/	Address bus
9	-5V		52	ADR7/	
10	-5V		53	ADR4/	
11	GND	Ground	54	ADR5/	
12	GND		55	ADR2/	
13	BCLK/	Bus Clock	56	ADR3/	
14	INIT/	System Initialize	57	ADR0/	
15	BPRN/	Bus Priority In	58	ADR1/	
16	BPRO/	Bus Priority Out	59	DATE/	
17	BUSY/	Bus Busy	60	DATF/	
18	BREQ/	Bus Request	61	DATC/	
19	MRDC/	Memory Read Command	62	DATD/	
20	MWTC/	Memory Write Command	63	DATA/	
21	IORC/	I/O Read Command	64	DATB/	
22	IOWC/	I/O Write Command	65	DAT8/	
23	XACK/	Transfer Acknowledge	66	DAT9/	Data bus
24	INH1/	Inhibit RAM	67	DAT6/	
25	AACK/	Advance Acknowledge	68	DAT7/	
26	INH2/	Inhibit ROM/PROM	69	DAT4/	
27	BHEN/	Byte High Enable	70	DAT5/	
28	ADR10/	Address bus bit 10	71	DAT2/	
29	CBRQ/	Common Bus Request	72	DAT3/	
30	ADR11/	Address bus bit 11	73	DAT0/	
31	CCLK/	Constant Clock	74	DAT1/	
32	ADR12/	Address bus bit 12	75	GND	Ground
33	INTA/	Interrupt Acknowledge	76	GND	
34	ADR13/	Address bus bit 13	77	-10V	
35	INT6/	Interrupt request on level 6	78	-10V	
36	INT7/	Interrupt request on level 7	79	+12V	
37	INT4/	Interrupt request on level 4	80	-12V	
38	INT5/	Interrupt request on level 5	81	+5V	Power input
39	INT2/	Interrupt request on level 2	82	+5V	
40	INT3/	Interrupt request on level 3	83	+5V	
41	INT0/	Interrupt request on level 0	84	+5V	
42	INT1/	Interrupt request on level 1	85	GND	Ground
43	ADRE/	Address bus	86	GND	

* All odd-numbered pins (1, 3, 5 . . . 85) are on component side of the board. Pin 1 is the left-most pin when viewed from the component side of the board with the extractors at the top. All unassigned pins are reserved.

Table 3-3. MULTIBUS Connector (P1) Signal Function

SIGNAL	FUNCTIONAL DESCRIPTION
ADR0/ ADRF/ ADR10/ - ADR13/	*Address.* These 20 lines transmit the address of the memory location or I/O port to be accessed. For memory access, ADR0/ (when active low) enables the even byte bank (DAT0/ - DAT7/) on the Multibus; i.e., ADR0/ is active low for all even addresses. ADR13/ is the most significant address bit.
BCLK/	*Bus Clock.* Used to synchronize the bus contention logic on all bus masters.
BHEN/	*Byte High Enable.* When active low, enables the odd byte bank (DAT8/ - DATF/) onto the Multibus.
BPRN/	*Bus Priority In.* Indicates to a particular bus master that no higher priority bus master is requesting use of the bus. BPRN/ is synchronized with BCLK/.
BPRO/	*Bus Priority Out.* In serial (daisy chain) priority resolution schemes, BPRO/ must be connected to the BPRN/ input of the bus master with the next lower bus priority.
BREQ/	*Bus Request.* In parallel priority resolution schemes, BREQ/ indicates that a particular bus master requires control of the bus for one or more data transfers. BREQ/ is synchronized with BCLK/.
BUSY/	*Bus Busy.* Indicates that the bus is in use and prevents all other bus masters from gaining control of the bus. BUSY/ is synchronized with BCLK/.
CBRQ/	*Common Bus Request.* Indicates that a bus master wishes control of the bus but does not presently have control. As soon as control of the bus is obtained, the requesting bus controller raises the CBRQ/ signal.
CCLK/	*Constant Clock.* Provides a clock signal of constant frequency for use by other system modules.
DAT0/ - DATF/	*Data.* These 16 bidirectional data lines transmit and receive data to and from the addressed memory location or I/O port. DATF/ is the most-significant bit. For data byte operations, DAT0/ - DAT7/ is the even byte and DAT8/ - DATF/ is the odd byte.
INH1/	*Inhibit RAM.* For system applications, allows iSBC dual port RAM addresses to be overlayed by ROM/ PROM or memory mapped I/O devices. This signal has no effect of local CPU access of its dual port RAM.
INH2/	*Inhibit ROM.* For system applications, allows ROM/PROM addresses to be overlayed by auxiliary ROM devices (e.g., a bootstrap program).
INIT/	*Initialize.* Reset the entire system to a known internal state.
INTA/	*Interrupt Acknowledge.* This signal is issued in response to an interrupt request.
INT0/ - INT7/	*Interrupt Request.* These eight lines transmit interrupt requests to the appropriate interrupt handler. INT0/ has the highest priority.
IORC/	*I/O Read Command.* Indicates that the address of an I/O port is on the Multibus address lines and that the output of that port is to be read (placed) onto the Multibus data lines.
IOWC/	*I/O Write Command.* Indicates that the address of an I/O port is on the Multibus address lines and that the contents on the Multibus data lines are to be accepted by the addressed port.
MRDC/	*Memory Read Command.* Indicates that the address of a memory location is on the Multibus address lines and that the contents of that location are to be read (placed) on the Multibus data lines.
MWTC/	*Memory Write Command.* Indicates that the address of a memory location is on the Multibus address lines and that the contents on the Multibus data lines are to be written into that location.
XACK/	*Transfer Acknowledge.* Indicates that the address memory location has completed the specified read or write operation. That is, data has been placed onto or accepted from the Multibus data lines.

Table 3-4. Auxiliary Connector (P2) Pin Assignment

(COMPONENT SIDE)			(CIRCUIT SIDE)		
PIN	MNEMONIC	DESCRIPTION	PIN	MNEMONIC	DESCRIPTION
1	GND	Signal GND	2	GND	Signal GND
3	5VB	+5V Battery	4	5VB	+5V Battery
5	Reserved		6	Reserved	
7	-5VB	-5V Battery	8	-5VB	-5V Battery
9	Reserved		10	Reserved	
11	12VB	+12V Battery	12	12VB	+12V Battery
13	PFSR/	Power Fail Sense Reset	14	Reserved	
15	-12VB	-12V Battery	16	-12VB	-12V Battery
17	PFSN/	Power Fail Sense	18	ACLO	AC Low
19	PFIN/	Power Fail Interrupt	20	MPRO/	Memory Protect
21	GND	Signal GND	22	GND	Signal GND
23	+15V	+15V	24	+15V	+15V
25	-15V	-15V	26	-15V	-15V
27			28	HALT/	Bus Master HALT
29			30	WAIT/	Bus Master WAIT STATE
31			32	ALE	Bus Master ALE
33			34	Reserved	
35			36	Reserved	
37			38	RESET/	Reset switch
39			40		
41			42		
43	Reserved		44		
45			46		
47			48		
49			50	Reserved	
51			52		
53			54		
55			56		
57			58		
59			60		

Notes:
1. PFIN, on slave modules, if possible, should have the option of connecting to INT0/ on P1.
2. All undefined pins are reserved for future use.

Table 3-5. Auxiliary Connector (P2) Signal Function

SIGNAL	FUNCTIONAL DESCRIPTION
ACLO	*AC Low*. Indicates a loss of AC voltage.
ALE	*Address Latch Enable*. Generated by CPU to provide auxiliary address latch.
HALT/	*Halt*. Indicates that the master CPU is halted.
MPRO/	*Memory Protect*. This externally generated signal prevents access to the dual port RAM during battery backup operation.
PFIN/	*Power Fail Interrupt*. This signal from the power supply interrupts the processor when a power failure occurs.
PFSN/	*Power Fail Sense*. Provides a latch for power failure event.
PFSR/	*Power Fail Reset*. Used to reset power fail sense latch.
RESET/	*Reset*. This externally generated signal initiates a power-up sequence.
WAIT/	*Bus Master Wait Signal*. This signal indicated that the processor is in a wait state.

CHAPTER 4
OPERATING INFORMATION

4-1. INTRODUCTION

This chapter provides operating information for the iCS 80 System. An operational description of the chassis switches and indicators is given. Familiarize yourself with all information presented in this chapter before attempting to operate the iCS 80 System.

4-2. CONTROL PANEL SWITCHES AND INDICATORS

The following switches and indicators are mounted on the iCS 80 Chassis control panel: a power OFF/ ON/LOCK key switch; a momentary INTERRUPT switch; a momentary RESET switch; a RUN indicator; and a HALT indicator. The function performed by each switch and indicator is described in the following paragraphs.

The power OFF/ON/LOCK switch (S1) is mounted on the right side of the control panel, and operated with a key, and used to apply power to the chassis. In the ON position, the switch allows user intervention of the program via the INTERRUPT and RESET switches. In the LOCK position, the switch disables the control panel. The key may only be removed when turned to the OFF or LOCK position.

The INTERRUPT switch (S2) is a momentary contact type. When activated, the switch generates an INT2/ signal from the control panel PCB. INT2/ is wired to pin 39 of the backplane (P1 connector).

The RESET switch (S1) is a momentary contact type. When activated, it generates the RESET/ signal from the control panel PCB. RESET/ is connected to pin 14 of the backplane and used to reset the system.

The POWER ON indicator is simply a green light emitting diode used to monitor the +5V power. The indicator illuminates when power is ON.

The HALT and RUN indicators are red and green light emitting diodes, respectively, that work together, depending on the state of three signals: WAIT/, HALT/, and ALE.

NOTE

If the system includes an iSBC 80/10A microprocessor, the HALT and RUN indicators are not usable; the iSBC 80/10A does not generate the WAIT/, HALT/, and ALE signals.

The RUN indicator illuminates whenever the CPU is executing an instruction. With the CPU in a WAIT state, neither the RUN nor the HALT indicator is illuminated.

The HALT indicator illuminates after the CPU executes a halt instruction. A control panel RESET or an INTERRUPT will remove the halt state.